

Statistical Analysis of Computer/IT Related Majors

Elton Vinh & Cromwell Cutaran

I. Summary of research questions and results

- Is Computer Science and Computer Engineering good majors to choose if you value your time and money.
- How does the unemployment rate of those who graduate with a computer/software related major compare to other majors?
- How popular are computer/software related majors compared to other majors?
- How easy it is to get a job after graduation?
- How do the earnings of those who graduate with a computer/IT related major compare to other majors?

II. Motivation and background

Going to college is expensive and time consuming. Choosing a major is perhaps one of the most important economic decisions one makes in life. Many people can relate to choosing a major that leaves them in crippling debt and with no job prospects after graduation. As students majoring in computer science and close to graduating we wanted to analyze through statistics the economic consequences of choosing computer science as our major. While the main focus will be on Computer Engineering and Computer Science, other computer/IT related majors will also be analyzed.

III. Data set

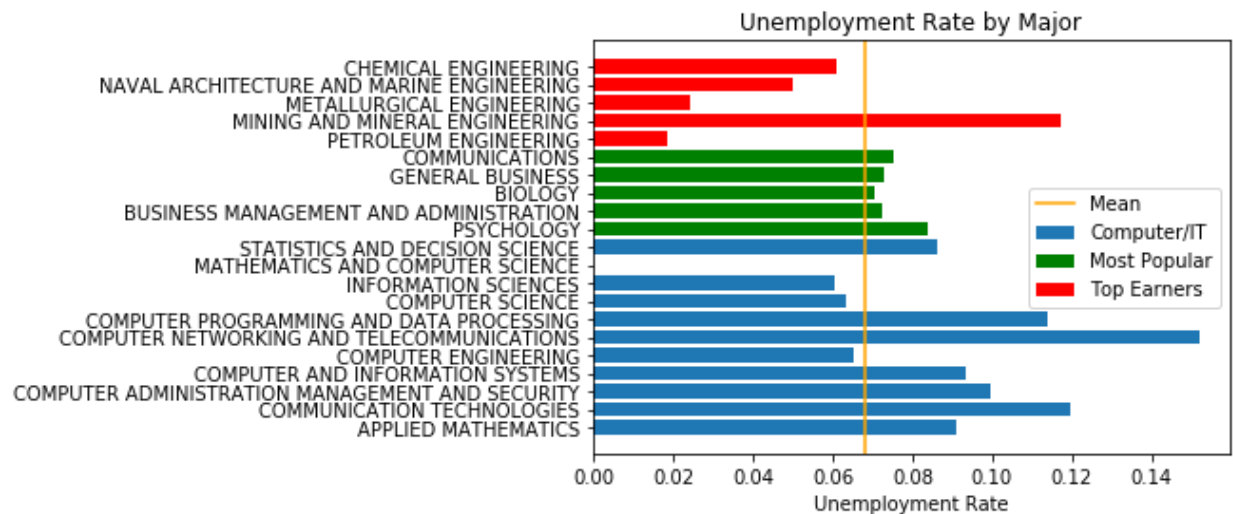
- FiveThirtyEight's college major dataset:
 - <https://github.com/fivethirtyeight/data/tree/master/college-majors>

Dataset was extracted by FiveThirtyEight from the United Census Bureau website. The original data was obtained from American Community Survey (ACS). The dataset we used was recent-grads.csv, where the ages did not exceed 28. A detailed outline of the headers in the recent-grads.csv is included in the link. The dataset includes many majors and we tried our best to look at the majors most relevant to our analysis.

IV. Methodology

The dataset contained many majors. The first step was obtaining a list of major codes that were related to Computer/IT. Fortunately, the dataset included major categories (such as 'Engineering') and we were able to filter the majors we were looking for. The majors that were not found from 'major categories' were found through keyword searches such as 'software'. Afterwards, doing statistical analysis required extracting the data from the relevant headers. For example, for earnings we used pandas dataframe sort and rank function to compile a top ranking. We also looked up separately the relevant computer/IT majors if they did not make the top ranks. This process was similar for all rankings we compiled. Some data was not directly available from the headers and had to be calculated using other headers. For example, non_college_ratio was derived from dividing total jobs by non_college jobs. For our graphs, we first extracted the data we were looking for from the headers once again and then plotted using matplotlib.

V. Results



How does the unemployment rate of those who graduate with a computer/software related major compare to other majors?

The unemployment graph above shows computer science and computer engineering having a unemployment rate below the average unemployment rate of all majors. As a comparison the top 5 most popular majors all have unemployment rates that are above the average. While the 5 highest paying (based on median) majors are all well below the average unemployment rates with the exception of Mining and Mineral Engineering. The unemployment rate of CS and CE are not different enough from the average to conclude that CS and CE graduates enjoy below average unemployment rates.

How popular are computer/software related majors compared to other majors?

The top 10 most popular majors are as follows:

Total_rank	Major	Total
1.0	PSYCHOLOGY	393735.0
2.0	BUSINESS MANAGEMENT AND ADMINISTRATION	329927.0
3.0	BIOLOGY	280709.0
4.0	GENERAL BUSINESS	234590.0
5.0	COMMUNICATIONS	213996.0
6.0	NURSING	209394.0
7.0	MARKETING AND MARKETING RESEARCH	205211.0
8.0	ACCOUNTING	198633.0
9.0	ENGLISH LANGUAGE AND LITERATURE	194673.0
10.0	POLITICAL SCIENCE AND GOVERNMENT	182621.0

In comparison, here's how computer/IT related majors rank in popularity:

Major	Total	Total_rank
COMPUTER ENGINEERING	41542.0	42.0
COMPUTER SCIENCE	128319.0	17.0
MATHEMATICS	72397.0	25.0
COMPUTER AND INFORMATION SYSTEMS	36698.0	48.0
INFORMATION SCIENCES	11913.0	100.0
STATISTICS AND DECISION SCIENCE	6251.0	123.0
APPLIED MATHEMATICS	4939.0	126.0
MATHEMATICS AND COMPUTER SCIENCE	609.0	171.0
COMPUTER PROGRAMMING AND DATA PROCESSING	4168.0	132.0
COMPUTER ADMINISTRATION MANAGEMENT AND SECURITY	8066.0	118.0
COMPUTER NETWORKING AND TELECOMMUNICATIONS	7613.0	119.0
COMMUNICATION TECHNOLOGIES	18035.0	78.0

Computer Science is a popular major, ranking 17th. CE while not as popular, still ranks in the top 50 at 42th. Popularity of the major can be either a bad or good indicator of job prospects. On one hand, a popular major can indicate a saturated job market, making getting a job related to the major after graduation tough. However, it can also be an indicator of a strong job market.

To come to a conclusion let's look at the type of jobs CS and CE graduates get.

How easy it is to get a job after graduation?

To answer this question we ranked the majors by non-college jobs / total jobs. That is what is the percent of total jobs from that major that are non-college jobs -- a job not requiring a college degree.

Major	Ratio_Non_college
GEOLOGICAL AND GEOPHYSICAL ENGINEERING	0.083333
MATHEMATICS AND COMPUTER SCIENCE	0.123162
MATERIALS SCIENCE	0.126210
MATERIALS ENGINEERING AND MATERIALS SCIENCE	0.133421
ACTUARIAL SCIENCE	0.134131
NURSING	0.142112
TEACHER EDUCATION: MULTIPLE LEVELS	0.145047
MATHEMATICS TEACHER EDUCATION	0.146858
SPECIAL NEEDS EDUCATION	0.150908
NAVAL ARCHITECTURE AND MARINE ENGINEERING	0.161648
PETROLEUM ENGINEERING	0.174079
ELECTRICAL ENGINEERING	0.181618
PHYSICS	0.182507
SCIENCE AND COMPUTER TEACHER EDUCATION	0.187109
CHEMICAL ENGINEERING	0.187136
COMPUTER ENGINEERING	0.188222

The table above shows the top 15 majors whose graduates are least likely to get a job that does not require a college degree. In this ranking both 'Mathematics and Computer Science' and 'Computer Engineering' make the list. Computer engineering reported only 18% of recent graduates working a non college degree. Computer Science saw 25.8% of recent grads working a non college job.

How about low wage jobs?

Major	Ratio_Low_Wage
MATERIALS SCIENCE	0.026146
MISCELLANEOUS AGRICULTURE	0.027193
MATERIALS ENGINEERING AND MATERIALS SCIENCE	0.030621
COMPUTER ENGINEERING	0.032242
NURSING	0.033661
AEROSPACE ENGINEERING	0.033877
SOCIAL PSYCHOLOGY	0.034774
EDUCATIONAL PSYCHOLOGY	0.037529
CHEMICAL ENGINEERING	0.040968
ELECTRICAL, MECHANICAL, AND PRECISION TECHNOLO...	0.041305
MECHANICAL ENGINEERING	0.044881
MATHEMATICS AND COMPUTER SCIENCE	0.045956
SPECIAL NEEDS EDUCATION	0.046858
TRANSPORTATION SCIENCES AND TECHNOLOGIES	0.049384
COMPUTER SCIENCE	0.051733

Once again CS and Math and CS make the top 15. Computer Science this time also makes an appearance with only 5% of recent grads working a low wage job.

While this does not tell us if CS and CE grads are likely to get a job related to their major, it does tell us that CS and CE grads are among the least likely of all majors to end up with a non college or low wage job.

How do the earnings of those who graduate with a computer/IT related major compare to other majors?

Ranking of Majors by median earnings of full-time, year-round workers. (Sample Size > 30)

Note: Ranks listed includes those with a sample size < 30

Rank	Major	Median
1	PETROLEUM ENGINEERING	110000
5	CHEMICAL ENGINEERING	65000
7	ACTUARIAL SCIENCE	62000
9	MECHANICAL ENGINEERING	60000
10	ELECTRICAL ENGINEERING	60000
11	COMPUTER ENGINEERING	60000
12	AEROSPACE ENGINEERING	60000
13	BIOMEDICAL ENGINEERING	60000
16	BIOLOGICAL ENGINEERING	57100
17	INDUSTRIAL AND MANUFACTURING ENGINEERING	57000

Engineering dominates this category. Computer engineering makes an appearance at the 4th spot tying with other engineering disciplines. Here is how computer/IT related majors compare.

Rank	Major	Median
11	COMPUTER ENGINEERING	60000
21	COMPUTER SCIENCE	53000
43	COMPUTER AND INFORMATION SYSTEMS	45000
46	INFORMATION SCIENCES	45000
47	STATISTICS AND DECISION SCIENCE	45000
48	APPLIED MATHEMATICS	45000
53	MATHEMATICS AND COMPUTER SCIENCE	42000
54	COMPUTER PROGRAMMING AND DATA PROCESSING	41300
82	COMPUTER ADMINISTRATION MANAGEMENT AND SECURITY	37500
85	COMPUTER NETWORKING AND TELECOMMUNICATIONS	36400
106	COMMUNICATION TECHNOLOGIES	35000

Computer Science while not in the top 10, still ranks highly in median earnings. As another point of comparison, the annual median personal income of the US was \$31,099 in 2016

(<https://fred.stlouisfed.org/series/MEPAINUSA672N>) . The majority of computer/IT related majors grads see median incomes above the national average.

What if you were a hard worker, or smart, or lucky, or all of the above? The top 75th percentile earnings of each major are ranked below.

Major	P75th
PETROLEUM ENGINEERING	125000
PHARMACY PHARMACEUTICAL SCIENCES AND ADMINISTR...	90000
BIOLOGICAL ENGINEERING	76000
CHEMICAL ENGINEERING	75000
COMPUTER ENGINEERING	75000
ACTUARIAL SCIENCE	72000
ELECTRICAL ENGINEERING	72000
FOOD SCIENCE	70000
COMPUTER SCIENCE	70000
PUBLIC POLICY	70000

In this ranking both CS and CE make the top 10. Both paying very well at the top end.

Conclusion

In answering our questions we found that Computer Science and Computer Engineering are economically sound choices as majors. While both fairly popular, CS especially, the statistics show that recent grads of CS and CE have little trouble finding (ranking among the best) jobs that require a college degree and are non low wage after college. This indicates that majoring in CS and CE are not wastes of time because they give you a high probability of landing a job that will utilize your college education. In addition, CS and CE saw slightly below average rates of unemployment. Recent grads of CS and CE also enjoy higher than average earnings with CE ranking among the best for median earnings. Those who are ambitious, exceptionally skilled, or lucky will also have a very high ceiling for earnings right after graduating as indicated by the ranking of the 75th percentile of earnings. In conclusion, Computer Science and Computer Engineers are very good majors to choose if you want to maximize your chances of getting a relevant and high paying job after graduation.